KNS spring meeting, Jeju, Korea, May 24, 2019

KINS is a Cornerstone for a Safe Korea

Fostering safety culture - approach taken by KINS and lessons learned

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Presentation outline

Introduction

- Development of safety culture(SC) & SC assessment methodologies needs lots of efforts including expertise, stakeholder involvement, critical thinking, and takes long time
- System thinking and systematic approach needed
- Adherence to international requirement

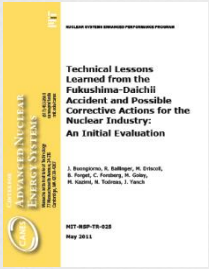
For regulatory body's internal safety culture (SCRB)

- Systematic development process
- Principles and practices adapted during the development process
- Brief introduction of assessment methodologies
- Implementation system supported by management system and leadership

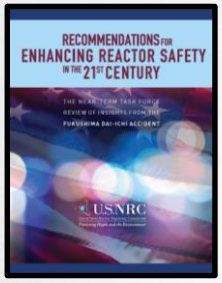
Current Activities for SCRB in KINS

- Policy
- Program
- Activities
- Challenges

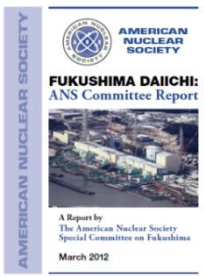
Why and how Fukushima Accident happened?



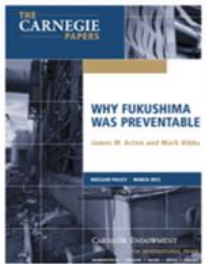
MIT, '11.5



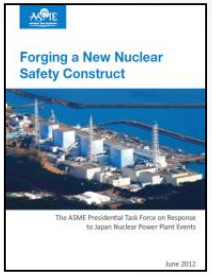
US NRC, '11.7



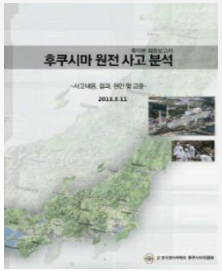
ANS, '12.3



카네기, '12.3



ASME, '12.6



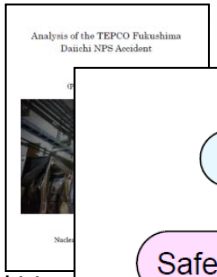
KNS, '13.3

민간 조사, '12.3.12

국회 조사 (NAIIC), '12.7.5

정부 조사(ICANPS), '12.7.23

JNS, '14.3



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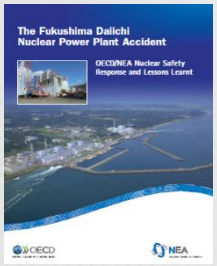
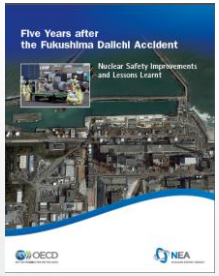


OECD/NEA, '13.9

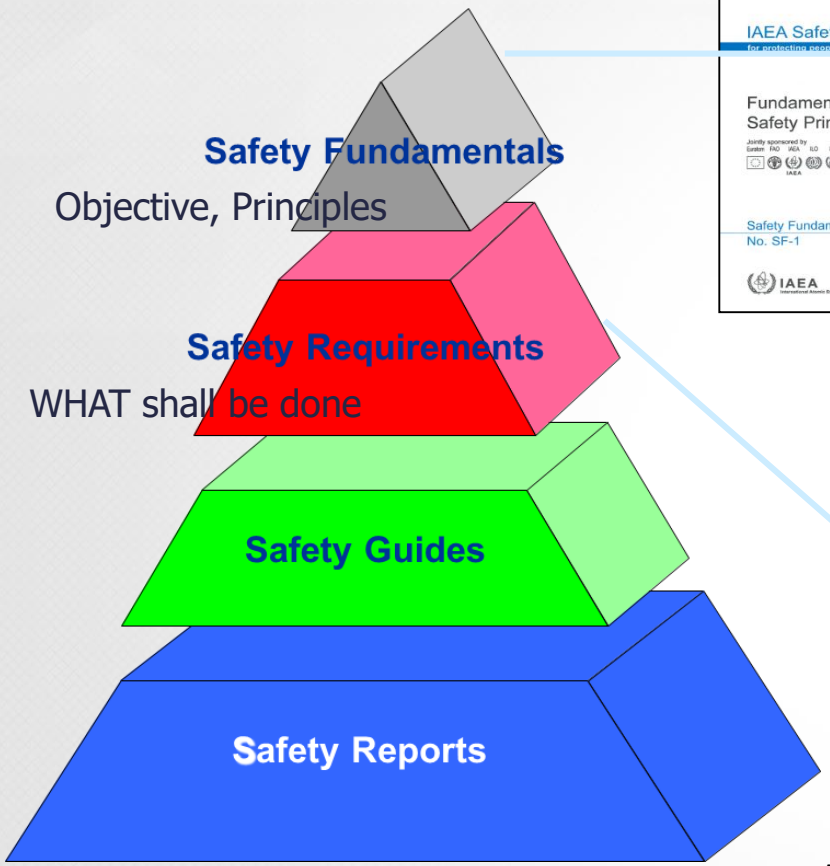
IAEA, '15.5

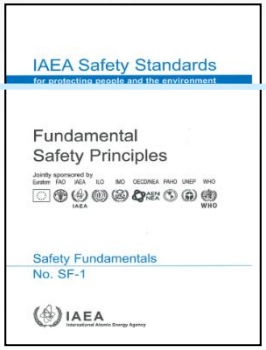


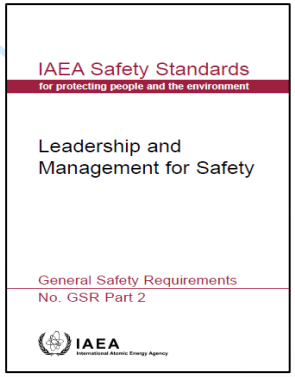
OECD/NEA, '16.3

Toyoshi Fuketa, NRA,
Joint Workshop on Challenges and Enhancements to Safety Culture of the Regulatory Body, June 3, 2015

International requirement on SC







IAEA GSR Part 2 (2016) : Leadership and Management for Safety

◆ Principle 3 - Leadership and Management for safety

"Effective leadership and management for safety must be established and sustained in organizations concerned with, and facilities and activities that give rise to, radiation risks"

- ◆ Fostering a strong safety culture
  - Developing leadership, establishing behavioural expectations
  - Establishing good practices in the area of safety culture
- ◆ Measurement, assessment and improvement of leadership for safety and safety culture

OECD/NEA's approach on SC of RB

OECD/NEA (1999):

The Role of The Nuclear Regulator in Promoting and Evaluating Safety Culture:

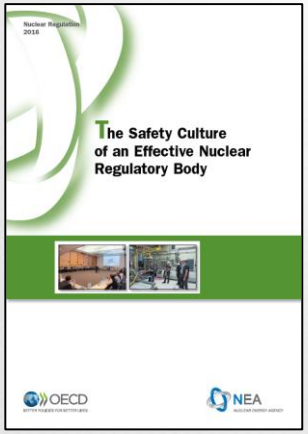
<<…dual role of the regulatory body in both (a) promoting safety culture, through its own example and through encouragement given to operators, and (b) evaluating the safety culture of licensees through performance or process based inspections and other methods≫

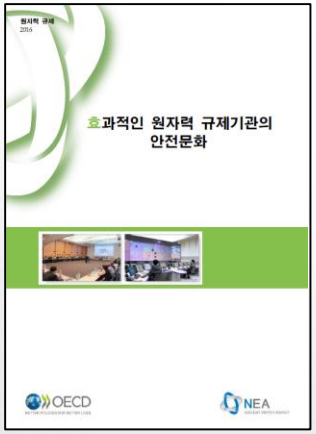
OECD/NEA (2016):

The Safety Culture of an Effective Nuclear Regulatory Body:

<<… it is paramount that the regulatory body not only consider safety culture as a matter of oversight but also as a matter of self-reflection. >>

Continuous improvement, learning and self-assessment is one of five principles constituting a framework for a healthy safety culture within a nuclear regulatory body





OECD/NEA
(2018, 2019, …)

Safety culture development ~2013 (1/2)

- The Korean government declared "**Nuclear Safety Policy Statement**" (1994)
  - (Chapter 2) Safety Culture
  - (Chapter 3) Regulatory Principles (5)
- "**Nuclear Safety Charter**" sets out top level philosophy and principles (2001)

❖ To promote safety culture in KINS (February 2000)

Mission Statement

- Recognizing that its ultimate clients are the general public, KINS shall perform nuclear safety regulatory functions objectively and with fairness, and also maintain independence from stakeholders including the licensees.
- … transparency … public confidence … technical capability … clear regulatory decision … effectiveness and rationality … international cooperation

Values to be shared

Ethics Statement

Chapter 1. General Provisions
Chapter 2. Basic Principles
Chapter 3. Principles for Regulatory Works
Chapter 4. Principles for Ethics, Fairness and Anti-corruption
Chapter 5. Provisions for Measures against Non-compliance
Chapter 6. Education and Assessment

Behavioural patterns to be promoted

Safety culture development ~2013 (2/2)

- Self-assessment of safety culture (2002)
  - Survey questions were developed using the elements of safety culture for regulatory body as suggested in INSAG-4 and OECD/NEA reports
- Socio-drama approach for SC (2003)
  - Role-playing between regulator and operator "Let's exchange our roles"

- Workshop for SC with NPP operators (2003~2007)
  - To exchanges views and opinion, to hear from the operators

❖ IAEA IRRS review mission in 2011
  - IRRS team suggested Korean regulators to prepare detailed measures for managing its own safety culture.

New initiative regarding SC of RB

- From International Trend
  - Lessons from Fukushima (IAEA Final Report on Fukushima Accident)
    - Safety myth, questioning attitude, continuous improvement, leadership for safety, agility, institutional memory, ..
  - Joint workshop titled "Challenges and Enhancements to Safety Culture of the Regulatory Body" in June, 2015
  - OECD/NEA report "The Safety Culture of an Effective Nuclear Regulatory Body" in 2016
  - IAEA GSR Part 2, June 2016 (Leadership and Management for Safety)
  - IRRS mission recommendation (2011, 2014)

- In 2013, NSSC and KINS established Joint Basic Plan for Safety Culture in regulatory body, which includes :
  - Basic directions and
  - Key activities of joint efforts
    - to develop processes to manage SC,
    - to assess current status of SC,
    - to develop and implement education and training on SC, and
    - to continuously improve SC

Safety culture development after 2014

Process for safety culture development

Step 1. Identify organizational characteristics

- Vision, mission, core values, code of conducts, requirements, regulatory frameworks

Step 2. Benchmarking study (foreign RBs)

- models, assessment methodologies, theoretical background, practices

Step 3.1. Development of Safety Culture Principles and Attributes

- series of internal communications, feedback from stakeholders

3.2. Development of Safety Culture Checklist based on principles

Step 4.1. Development of Safety Culture Promotion program

4.2. Development of Safety Culture Management Procedure

- To mandate safety culture activities and involvement of all staff

Step 5. Prepare the database and education program

- Development of e-learning contents for online course for SC

Step 6. Self-assessment and identification of improvements

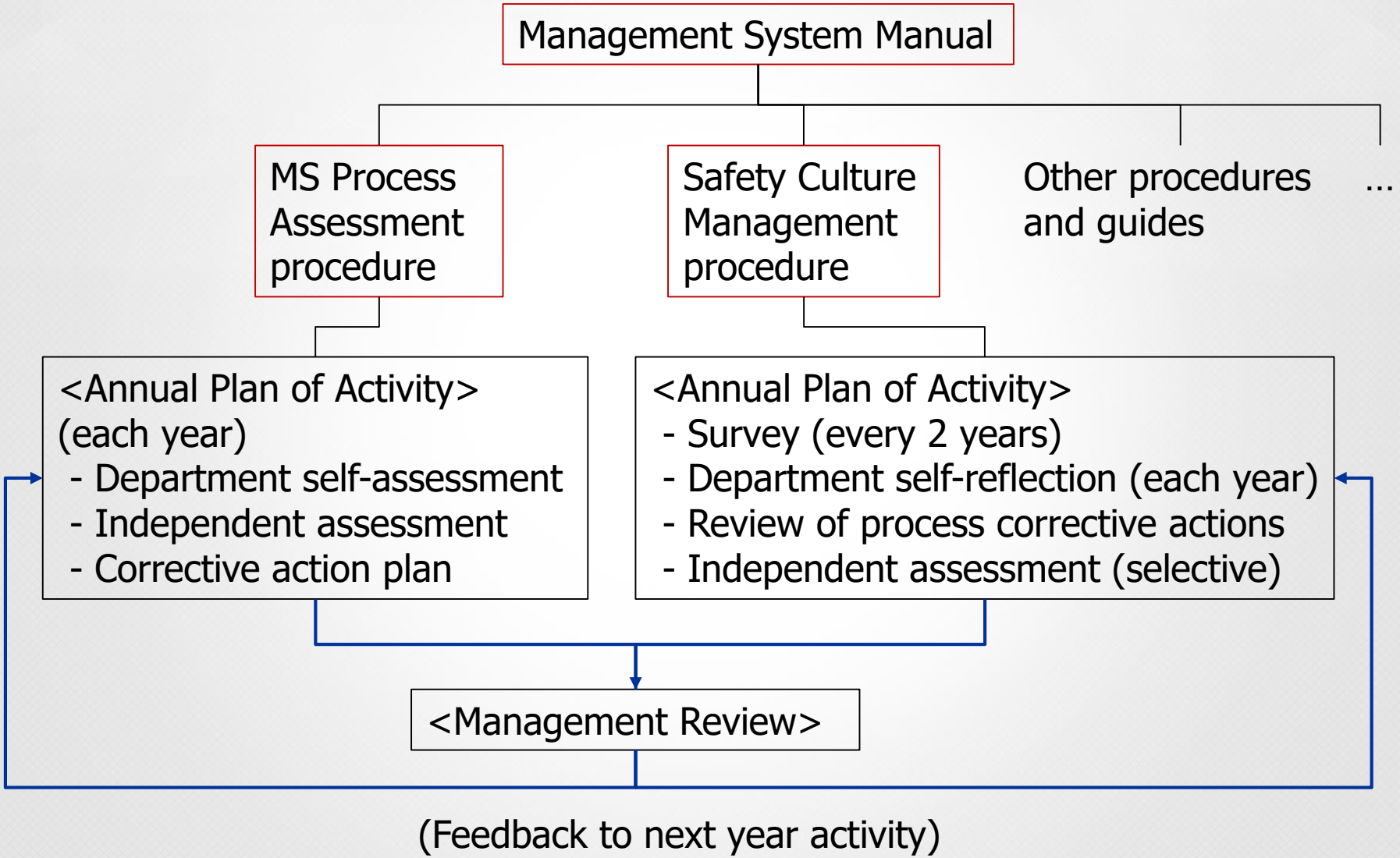
Step 7. Development of Action Plan and Feedback

Management system and Safety Culture

- In Nov. 2014, KINS declared Safety Culture as a prerequisite for achieving its organizational missions in its Management System manual
- In May 2016, Safety culture principles for KINS have been established
  - To provide behavior principles to be performed in their individual activities and to establish safety culture within the organization.
  - Self-assessment checklist are developed.
- In Oct. 2016, KINS developed the "Safety Culture Management Procedure."
  - To ensure appropriate and timely implementation of safety culture measurement, assessment, improvement, communication and education activities
  - The procedure describes role of management and individuals, and provisions to foster and improve SC including diagnosis, assessment, improvement, communication and education.

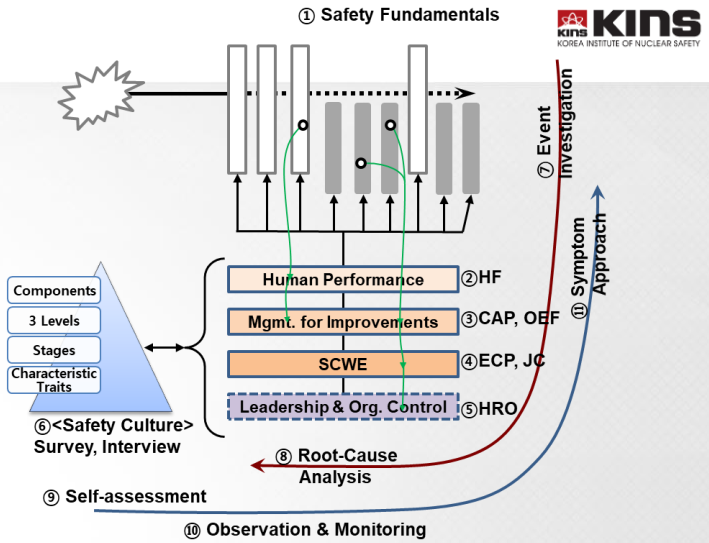
Safety Culture Management Procedure

Continuous improvement process & procedure

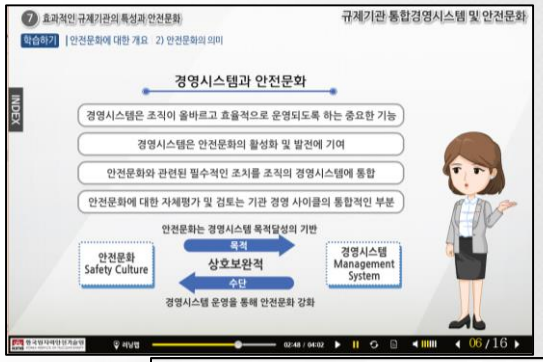


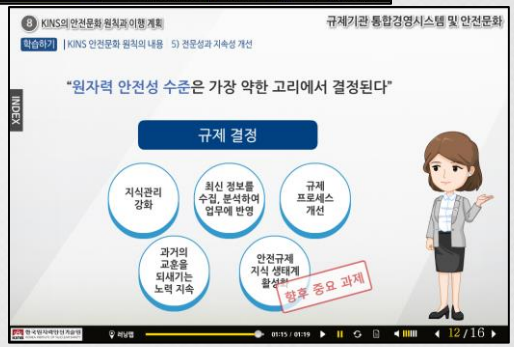
SC Competency building

- Basic & Professional course for oversight of licensee's SC
  - Each year's education program is planned and developed using safety culture knowledge map



- Off-line classroom training
  - Effective for interactive discussion
  - But unavailable for inspectors who have a lot of trip schedule
- E-learning Program (4 hours, 1.5 hours)
  - Contents for Management System
  - Root cause of Fukushima accident
  - The importance of SCRB
  - The characteristics of effective RB
  - Basic concept and historical background of SC
  - Cultural factors essential for RB
  - Explanation of SC Principles and Attributes
  - Program and Activities





Activities to promote SC

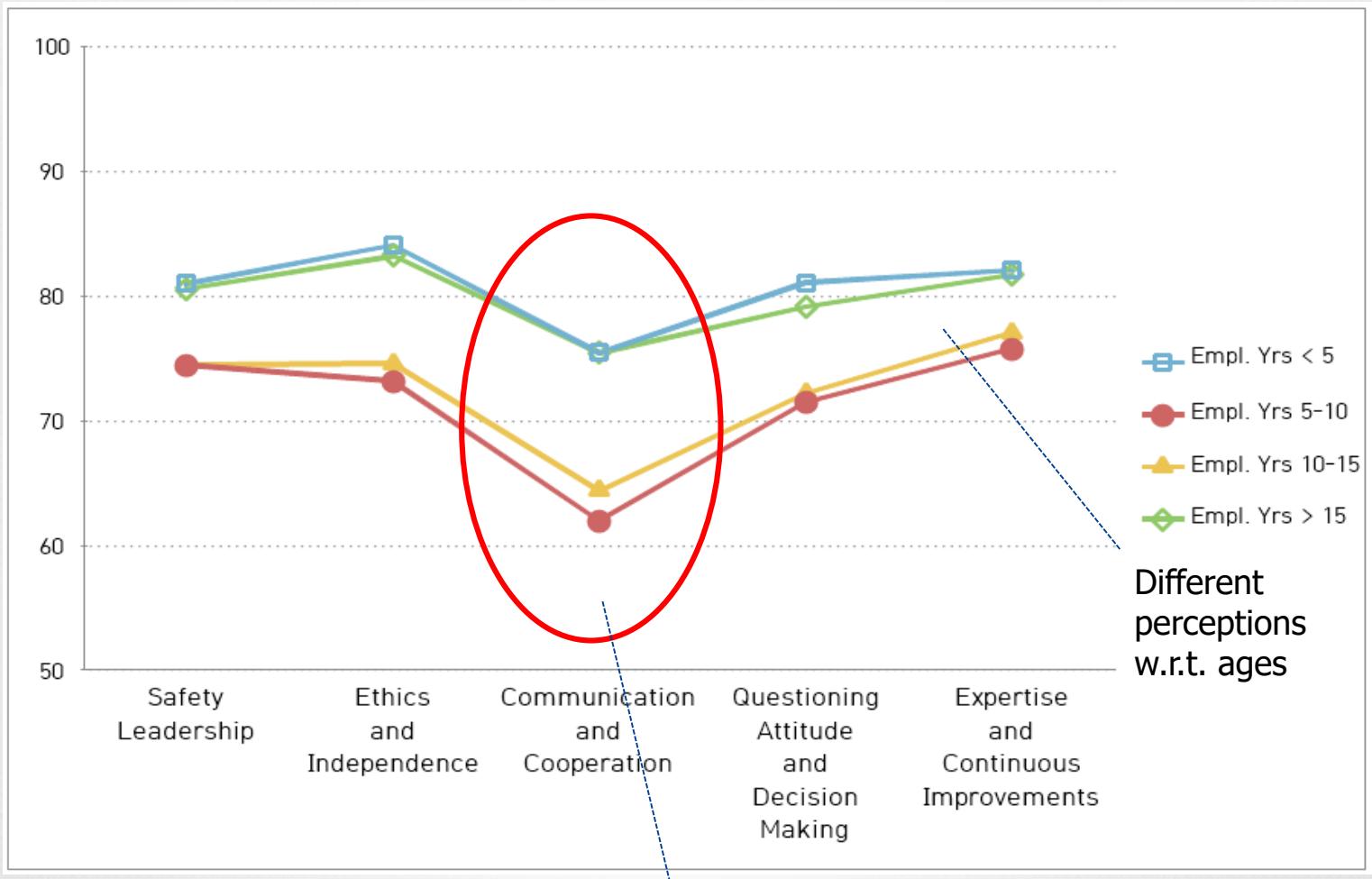
SC Principle	Actions for SC principle
Leadership for Safety	• Learning Fukushima lessons (Education, Sharing of analysis result) • Assessment according to GSR Part 2 requirement • Sharing of management's speeches and presentations • Implementation of IMS and periodic assessment (management's assessment)
Ethics and Independence	• Education on Ethics/Integrity • Integrity level assessment of KINS staffs (annual) • Benchmarking of Independence principles
Communication and Cooperation	• Expansion of shared space (meeting room, discussion after education, lounge with coffee machine, etc.) • Activate Differing Professional Opinions system • Consideration of Cross-cutting areas when developing processes • Evaluation of Cooperation between departments
Questioning Attitudes and Decision-Making	• Sharing of Regulatory Experiences • Assessment of 'conservatism' • Assessment of urgency
Expertise and Continuous Improvement	• Implementation of Career development program • Regulatory process improvement (IMS) • Periodic check of the usage of Knowledge management system • Operation of 'Lessons Learned Program'

Safety culture assessment

◆ IAEA requirement on SC assessment : Measurement, assessment and improvement of leadership for safety and safety culture

- (step 1) Questionnaire survey : perception on how much each principle and attribute is observed
  - 40% of KINS staffs participated in the survey (on-line)
- (step 2) Department level self-reflection : success or failure stories
  - Each department within KINS is required to evaluate current work practices and climate by use of SC attributes and Self-assessment Form
- (step 3) Independent assessment by ad-hoc team
  - To collect views and opinions about the causes of the perception identified in step 1 and 2
  - Individual interviews and group interviews to about 10% of the staff
  - Descriptive and Normative analysis using IAEA SRS-83 methods
- (step 4) Development of action item and Feedback
  - Self-assessment of SC and MS assessment are used to derive complement items and corrective actions(CAs).
  - CAs are implemented and managed by MS and internal procedures.

- Preliminary survey response analysis



- Comparison of SC assessment methods

	Survey	Department level self-reflection	Assessment by Ad-hoc team
Resource	20 man-days for survey administration and analysis	- Dependent on manager's approach (brainstorming, discussions)	103 man-days for team activities, + Team member's preparation time, + Secretariat aids
Difficulties and problem	It is not plausible to reach the deep layer of organizational culture	The quality of reflection was dependent on the manager's enthusiasm	Difficult to form an Independent Assessment Team and to find external experts for SC of "Regulatory Body"
	Can't explain the numbers (why) without further investigation	Support departments were not fully motivated	Lack of reference

Assessment of Leadership for Safety

◆ IAEA requirement on SC assessment : Measurement, assessment and improvement of leadership for safety and safety culture

- The Safety Culture Principles of KINS include 'Safety Leadership'

All management and staff members of KINS shall demonstrate a leadership for safety as the highest priority in their regulatory activities while recognizing that severe accidents might occur during the production and use of nuclear power.
Our management shall lead inside and outside of the organization by example with consistent words and behavior and attitude that prioritize the safety first, and improve the quality of safety regulation by securing resources needed for regulatory works and ensuring the effectiveness of management system.

– Each principles include **management' responsibility**, which are **assessed by staffs**

The management shall protect the employees from being influenced by undue pressure and establish the institutions and environment for maintaining independence.
The management shall ensure that members of the organization will be able to provide their professional opinions freely and support constructive criticism, and activate information exchanges and cooperation through various ways and channels of communication.
The management shall make timely regulatory decisions and take actions for safety significant issues in an agile manner according to established standards and procedures.
The management shall create a learning environment to cultivate expertise among members of the organization and actively strive for knowledge management and lessons learned system.

Self-reflection and Self-assessment

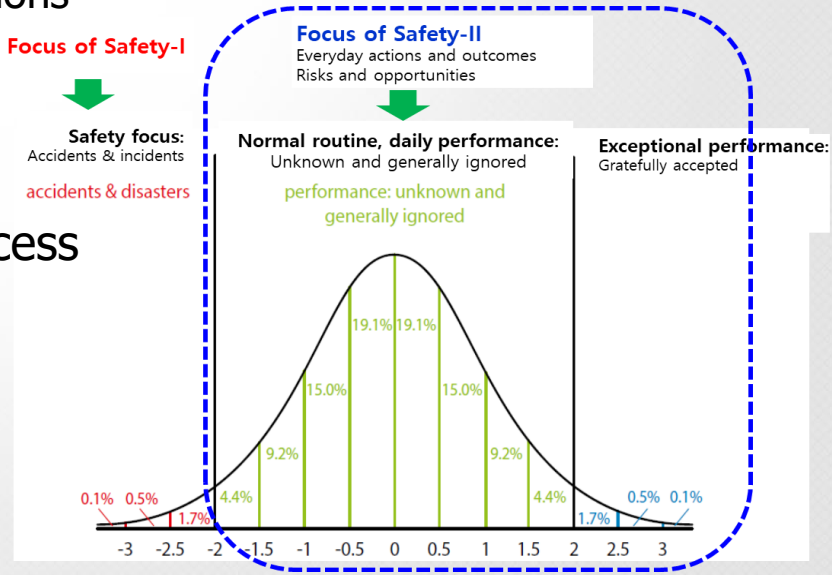
OECD/NEA (2016) The Safety Culture of an Effective Nuclear Regulatory Body:
<<…The regulatory body profoundly impacts the licensee's safety culture and its sense of responsibility for safety. Hence, the regulatory body needs to be conscious of its own safety culture's impact on the safety culture of the organizations it regulates and oversees... >>
<<…For this reason, it is paramount that the regulatory body not only consider safety culture as a matter of oversight but also as a matter of self-reflection. >>

- **Self-reflection**: descriptive (non-evaluative) introspection activities within the regulatory body aimed at understanding its own way of functioning and its impact on safety and the safety culture of the licensees and contributing to an environment of continuous learning.
- **Self-assessment**: normative assessment activities within the regulatory body against a set of predefined criteria by means of a systematic and structured process. It aims at continuous improvement towards the fulfilment of specific norms or requirements.

- Voices from licensees as a basis for self-reflection
  - Annual PCSI(Public Customer Satisfaction Index) survey result analysis
    - Trending, comparison with other governmental organisations
  - In 2018, 'nuclear regulation service' survey by performance department
    - Questionnaire survey(on-line) and Focus group interviews are used

Challenges and lessons learned (1/2)

- Lack of reference
  - Only one published self-assessment experience from Swiss regulator ENSI
  - Concrete examples, meaningful and useful guidance for behavior are needed
- Effectiveness of the SC assessment methods
  - Each assessment method has its own merits and demerits
  - Financial and human resource should be stable to continue the long-term cycle of assessment
- SC capacity building
  - Hard to modify e-learning contents
  - E-learning : Lack of opportunity for discussions
- Handling of sub-culture
  - Involving support department staffs
- Learning from failure vs learning from success



Challenges and lessons learned (2/2)

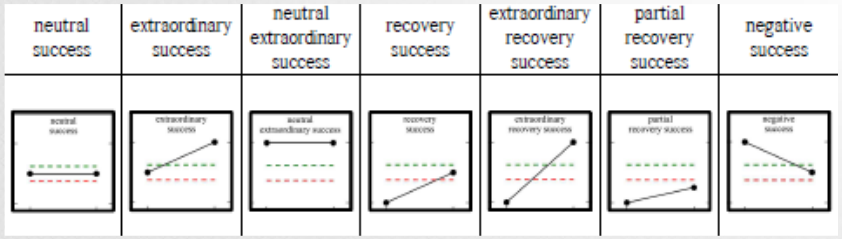
- Learning from failures (safety-I) vs learning from successes (safety-II)

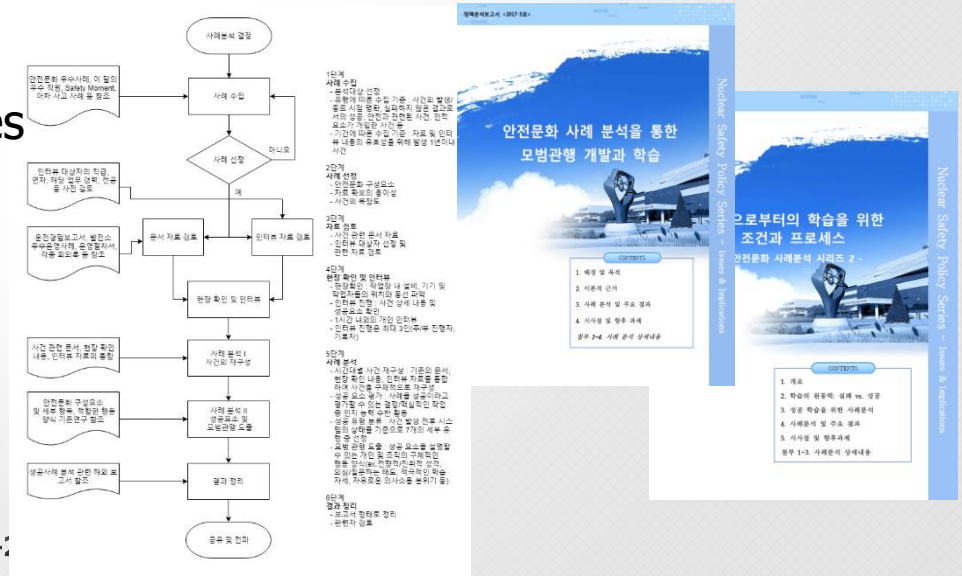
Louis Slotin 실험	최소 안전장치 부재	위험성 인식 부족, 실험관행	사고경험 미전파	동료의 문제 제기 부족	경쟁 압박
NRX	Pw rate trip, 표시기 문제	의사전달 실수	고장/오류 방치	정보공유 및 지식 관리 미흡	조직확대에 따른 변화관리 부족
Windscale	계측기 미설치	절차서 부재		운영/기술조직간 소통 미흡	업무분장 불명확, 경제성 우선
SL-1	제어봉 인출 결함	근무적합성, 절차서 부재		설계 오류의 공유 미흡	다수 조직참여에 따른 책임 희석
TMI	기기결함	운전원 판단오류	운전경험 미반영, 절차 미개정	안전건의 방치	경제성 압박
체르노빌	설계 전반 미흡	운전원 이해부족	전조사건 미반영	결함 미보고	안전책임 부재, 전력생산 압박
미국 DB	이종금속용접 PWSCC	사소한 징후 간과	붕산부식 관리 미흡	ECP 제도 미흡	리더십 부족 경제성 우선
미국 PV	-	종사자 감독 미흡	조직 이슈에 대한 진단 미흡		감원에 따른 변화 관리 부족
후쿠시마	설비개선 미흡	- 미정 -	최신 안전기준 미반영	효과적 문제제기 경로 미비	- 미정 -
	설비/설계 개선	인적 수행도 관리	경험반영과 개선관리	안전중시 업무환경	리더십 및 조직관리

Erik Hollnagel et al. (2013)

❖ Learning from Successes Report by analyzing licensee's safety culture cases

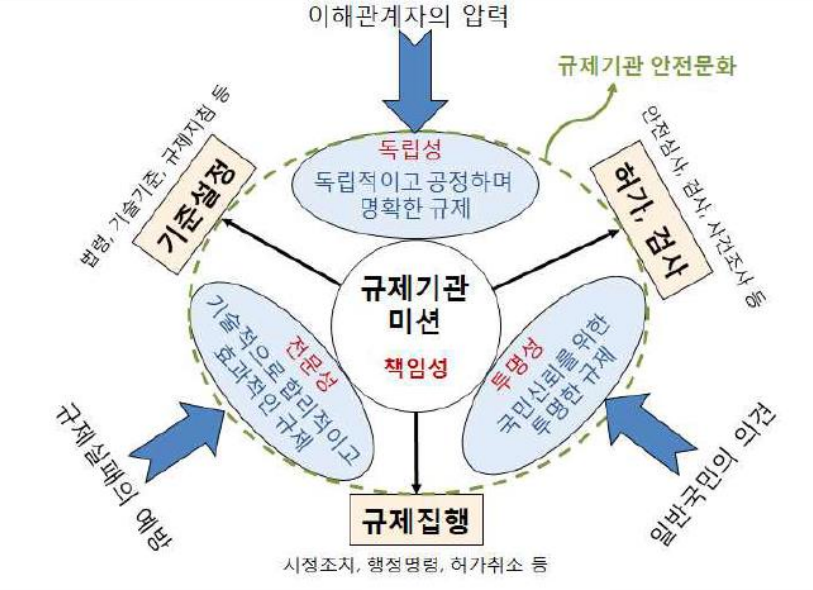
* Pilot application of safety-II concept to analyze the success cases in NPPs





Concluding remarks

- Meaning of safety culture of regulatory organization
  - External adaptation + Internal integration for mission accomplishment



- Value of views and opinion from licensees as an input for self-reflection
- Learning from success
  - Identification of good behaviors and practices that lead to a success
  - Development of motivation mechanism to internalize into all the activities the good behaviors that occurs in particular cases

THANK YOU

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